GRETA NILÉN received her Bachelor of Science degree in Biology from Uppsala University, Sweden, in 2015. She completed her Master of Science in Ecotoxicology in 2017 and has since then been a PhD student in Biology with a specialization in Environmental science at the Man-Technology-Environment (MTM) Research Centre at Örebro University.

Organisms in the environment are exposed to a wide range of pollutants occurring in complex mixtures. However, the current risk assessment of chemicals is mainly focusing on single compounds. The overall aim of this thesis was to investigate the toxic responses of mixtures of environmental pollutants and integrate those results into risk assessment. In addition, the project aimed to fill crucial gaps in the knowledge regarding molecular and mechanism-specific effects of mixture toxicity by using *in vitro* and *in vivo* methods in addition to chemical analysis. Effects at various biological levels of organization were studied, including outcomes from swimming activity, gene expression, lipid content analyses, image analysis, and chemical analyses.

The results proved the need for more sensitive endpoints when investigating toxic mechanisms of mixtures, for instance, behavioral tests, gene expression analysis, and image analysis. In brief, the artificial mixtures containing PFOS, PCB126, B[*a*]P, and Arsenate and the complex environmental mixture from a soil contaminated with predominantly PACs caused behavioral changes in zebrafish larvae. Furthermore, the lipid contents were altered, and genes connected to adverse outcomes were regulated. Image analysis of morphological features revealed a reduction of for instance the swim bladder and the pericardium and enlargement of the yolk in the exposed larvae.

In summary, this thesis represents a valuable contribution to the understanding of toxicological mechanisms in zebrafish embryos and provides new approaches for the investigation of molecular mechanisms underlying adverse outcomes. Future investigations need to focus on effect-directed analysis approaches to detect the toxic drivers in complex environmental mixtures. Further, this is needed to determine whether the substances pose a risk to human health or the environment.

ISSN 1650-6278
ISBN 978-91-7529-528-2

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2023

ÖREBRO UNIVERSITY

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A mechanistic approach

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Örebro Studies in Environmental Science 19 | ÖREBRO 2023

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